A NEW GENUS OF CHYTODESMID MILLIPEDS FROM PERU[1]

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The milliped described below was represented in a collection of species taken by Plant Quarantine inspectors of the Agricultural Research Service, and sent to me for determination by Dr. Ralph E. Crabill, Jr.

The naming of a single species or even a genus from any tropical country contributes very little to an understanding of the total diplopod fauna of the region, and the recent series of papers on Peruvian millipeds by Chamberlin (1941, 1955) and Kraus (1954-60) give an indication of the profusion of Andean species. I am proposing the present new names because of an interesting structural departure which I do not know in any other known forms, and because of the opportunity to express an opinion on the family name Chytodesmidae, a group which has been disregarded by virtually all recent students of the Diplopoda.

Probolocryptus, new genus

Type species: P. krausi, new species.

Diagnosis: A chytodesmid genus characterized by the form of the paranota of segment 18, which are acutely produced cephalad while the caudal corners of these paranota, normally produced caudad in most polydesmoids, are rounded off completely. The partial coalescence of two of the posterior paranotal lobes of most segments appears to be also diagnostic. The gonopods bear a resemblance to those of *Docodesmus*.

Body composed of head and 20 segments, the collum enlarged to cover the head, its margin 12-lobed; paranota of 2nd segment larger than the others; body broad in proportion to length, the W/L ratio about 28 per cent. Surface of metatergites densely granular, most segments with four longitudinal rows each composed of two enlarged tubercules; on posterior segments a third tubercule is added to each series. Segment 19 reduced in size, its paranota narrow and without definite lateral and posterior sides; segment 20 small, partially concealed by 19th, the conic-rounded epiproct nearly hidden by two large paramedian tubercules. Ozopores tiny, difficult to observe, located near the center of the paranota of segments 5, 7, 9, 10, 12, 13, 15-19.

Legs relatively long and slender, not originating from elevated podosterna, their bases approximate, the sternal areas glabrous and unmodified. Stigmata tiny, round, without elevated rims. Neither anterior legs nor sterna specially modified in males. Vasa deferentia open through small pores flush with coxal surface, no produced seminal processes present.

Gonopod aperture large, transversely oval, the rim slightly thickened but not particularly elevated or flared, both anterior and posterior margins slightly produced at midline, causing a distinct median constriction of the opening. Gonopods large, the coxae produced mesiad and in contact over a short distance but not fused to any extent; ventral surface of coxae densely granulose-setose; no coxal

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apophyses developed. Telopodite consisting largely of a setose prefemoral region terminating distally in (1) a slender, simple, falcate branch and (2) a short, membranous, digitiform prefemoral process. No distinct femoral and tibiotarsal regions evident beyond prefemur, only a slender, simple branch which carries the seminal groove.

Sternum of 3rd segment of females with a simple, erect, thin crest concealing the bases of the second pair of legs.

Distribution: Peru.

Probolocryptus krausi, new species
(Figures 1-6)

Type specimens: Male holotype and female paratype, U. S. Nat. Mus. 2930, taken from an air shipment of bromeliads from Peru by Plant Quarantine inspector A. S. Mills at Miami, Florida. Precise origin of the shipment is unknown.

Diagnosis: With the characters of the genus; specific features probably occur in shape of the male gonopods and of the limbus.

Description of holotype: Adult male, 13.0 mm long, maximum width across metatergites 3.6 mm, with W/L ratio about 28 per cent. Body outline essentially parallel over segments 4-16, the widths of selected segments as follows:

Collum	2.4 mm	12th	3.4 mm
2nd	3.0	16th	3.3
4th	3.5	18th	2.9
6th	3.6	19th	1.5
8th	3.5		

Head (figure 1) reflexed caudoventrad, nearly horizontal, the vertex densely granulate, with deep median depression and pronounced supraantennal shelf on each side. Genae convex, not margined, both genae and frons smooth, setose. Clypeus smooth, distinctly elevated as a transverse facial ridge; labrum smooth, depressed, with 8 labral setae.

Antennae relatively long and slender for a cryptodesmoid species (fig. 1), all of the articles distinctly longer than broad, the 5th largest as usual in this group, all articles setose but none with evident sensory areas. Length relationships: $5 > 3 > 4 = 3 = 2 > 7 > 1$. Terminal sensory cones long and slender, widely separated basally.

Collum (fig. 2) distinctly broader than head, which it completely conceals. Upper surface irregularly granulate-tuberculate, the discal area convexly elevated; front and side areas depressed, paranota horizontal; anterior edge 12-lobed; caudal edge nearly straight, entire, with a small but distinctly elevated marginal ridge. Outline of collum subtrapezoidal, the sides convergent anteriorly, the front edge nearly transverse and with the incisions less distinct.

Segments 2-16 subsimilar: dorsum slightly arched, paranota broad and slightly depressed from the horizontal, each paranotum about as wide as diameter of body cavity. Metatergites very abruptly elevated above level of interzonal furrow and the following prozonite, this elevated surface wider distally than at its base thus forming an overhang at each edge. Surface of metatergites rough, not encrusted with earth particles, each segment with four longitudinal rows of two tubercules each, those of the paramedian series are set in a straight line; in the outer series the anterior tubercule is slightly laterad of the posterior. Surface of segments with numerous small conical granules between the seriate tubercules,

these granules becoming larger and more conspicuous on the paranota. Interzonal furrow shallow but sharply defined, its surface smooth; surface of prozonites finely reticulate. Limbus (fig. 6) consisting of long, slender, digitiform lobes basally connected by minutely fringed webbing; each process contains a medial canal, often branched, each canal is tipped with a tiny globule (?secretion) where it meets the surface of the process.

Segments 15-19 becoming progressively narrower and more strongly ornamented dorsally. A third transverse row of tubercules is added on the caudal margin of the metatergites, this marginal row becoming elongate-conical and quite prominent on segments 18-19 (fig. 3).

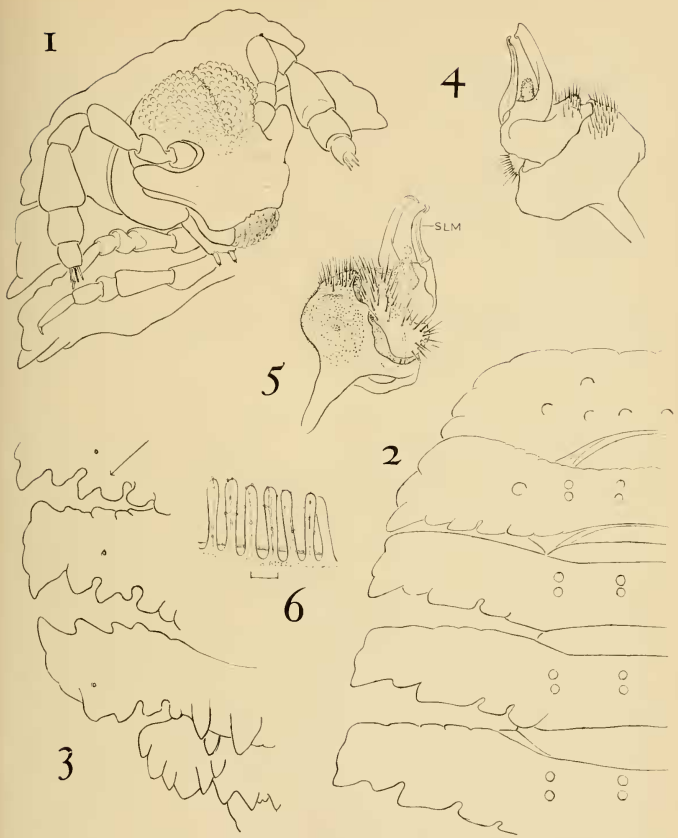
Paranota of 2nd segment largest, the anterior edge curved forward and slightly crenulate, posterior edge nearly transverse, 4-lobed, caudolateral corner prolonged conically. Paranota of most following segments transverse, narrower than the 2nd, and with the anterior margin becoming more distinctly lobed, posterior edge incised into four distinct lobes back to segment 17; of these lobes, the 2nd and 3rd are distinctly largest, and only partially separated from each other by a shallow notch, imparting a characteristic shape indicated by the arrow in figure 3. Paranota of segment 18 unusual in form, directed cephalad, and with the caudolateral corners rounded off so that both the corner and the 4th posterior lobe are missing. Lateral ends of most paranota indistinctly 3-lobed. Ozopores very small, difficult to observe, located at base of lobe 3 nearly at center of the dorsal paranotal surface (fig. 3).

Epiproct small, almost concealed by the projecting tubercules of segment 19, its dorsal surface produced into 6 large tubercules in a transverse row, the two median tubercules larger and projecting beyond apex of epiproct, latter rounded, with four terminal setae. Proctodeum everted and concealing appearance of paraprocts and hypoproct, but latter seems to be of normal polydesmoid form, a transversely elongate, convex plate, with distinct median apical projection.

Legs attached to elevated, contiguous, glabrous subcoxal swellings, no distinct podosterna formed. Legs long and slender, most of tarsus visible beyond ends of paranota when extended laterad; podomeres smooth, sparsely setose on ventral surfaces, the distalmost podomeres setose dorsally as well. Length relationships: $6 = 3 = 2 > 5 > 4 > 1$. No special lobes, hairs, or processes on any of the legs. Pleural surfaces of metazonites finely granular. Stigmata tiny circular pores, flush with surface, both located near upper end of anterior coxal socket, similar in size and shape.

Sternum of 2nd pair of legs fused firmly with pleurotergite of 3rd segment. Coxae without seminal processes, the vasa deferentia open through tiny round pores flush with the surface. Anterior legs and sterna unmodified.

Gonopod aperture large, transversely oval, extending laterad well beyond ends of coxal sockets of 7th segment, both anterior and posterior edges are slightly produced at the midline, causing a median constriction of the aperture. Gonopods relatively large, most of the coxae visible in situ, no particular sternal element present between them. Surface of coxae finely and densely granulate, the distal surfaces also densely setose. Telopodite set at end of coxa, essentially in the same plane with it. Prefemur setose as usual, about half the telopodite length, distally produced into a submembranous tuberculate process. Two distal elements beyond the prefemur, a slender, nearly straight, unbranched process carrying the seminal groove (fig. 5, SLM), and a parallel, slightly broader branch just laterad



Figs. 1-6. **Probolocryptus krausi,** new species. Fig. 1. Ventrolateral aspect of anterior end of body, showing head and first three body segments; fig. 2. Dorsal aspect of left side of first five body segments, to show relative size and shape of paranota, and major dorsal tubercules; fig. 3. Oblique dorsolateral aspect of posterior end of body, showing outlines of paranota 16-19, also a few of the larger dorsal tubercules. The arrow points out the peculiar, incompletely separated 2nd and 3rd lobes of the posterior paranotal margin; fig. 4. Left gonopod of holotype, oral aspect, tuberculation of coxa not shown; fig. 5. Left gonopod of holotype, aboral aspect. SLM: solenomerite; fig. 6. Portion of limbus from dorsal side of a midbody segment. The scale represents 20 microns.

to it, this branch may be a second prefemoral process, or might be interpreted as being femoral or postfemoral in its homology.

Dorsal surface of metatergites and vertex of head brownish-black. Prozonites, frons, clypeus, and dorsal tubercules whitish-pink. Legs testaceous to light brown. Paranota of segments 5, 7, 9, 10, 12, 13, 15-17 with a large, central whitish area just cephalad to the ozopore and thus roughly approximating location of the internal gland.

Female paratype: Slightly larger than male, width to 3.8 mm., but otherwise agreeing closely in structural details. Elevation of the clypeus not so pronounced as in the male, and body cavity slightly greater in proportion to total width across paranota. Segment 3 with a high, thin, median epigymal crest, its edge smooth and unmodified, this crest extends distad about halfway to end of the femoral segment of the 2nd legs.

Name: The generic name alludes to the anteriorly projecting paranota of segment 18, which so far as I know is unique to the present species. The specific name is proposed in recognition of the numerous contributions of my friend and colleague, Dr. Otto Kraus, the leading authority on Peruvian Diplopoda.

Classification

The correct systematic position of this genus is not easy to determine. Following the tradition of Attems, it would be placed in the "family" Cryptodesmidae, the limbo for all small polydesmoids with an enlarged flabellate collum. In my opinion, however, the group so defined is hopelessly heterogeneous, and should be dismembered into a number of smaller and more compact natural groups. Such a partition cannot, I think, be effectively achieved unless genera are compared and associated on the basis of all available characters, not merely isolated features such as gonopods, nature of the ozopores, shape of the epiproct, and so forth.

Beginning in 1896, O. F. Cook proposed a considerable number of family names for the so-called cryptodesmids, but owing to the very unsatisfactory original descriptions the Cook names have never been generally accepted. Only H. F. Loomis, in numerous papers on Neotropical forms, has followed Cook's classification. I have become convinced that Cook's families do represent natural and valid groups of genera; whether these groups should be regarded as families, subfamilies, or tribes is a subjective matter and of no real importance in the present state of our knowledge. What is important, I think, is that the groups appear to be homogeneous and made up of obviously related genera. This is much more than can be said for the systems proposed by other workers.

So far, the nominal families Cryptodesmidae, Decaporodesmidae, Stiodesmidae, Hercodesmidae, Chytodesmidae, Stylodesmidae, Peridontodesmidae, Eoromidae, and Ceratesmidae have been proposed for "cryptodesmoid" genera occurring in the New World tropics, most of the names authored by Cook.

The oldest name is Cryptodesmidae, proposed by Karsch in 1879 on the basis of an erroneous observation (the ozopores were thought to be absent). In his somewhat devious essay "Cryptodesmus and its

allies" Cook (1896) narrowly limited the scope of the family, after having studied the original type of *Cryptodesmus olfersi* (Brandt) in the Berlin Museum. The following notes were given:

"The antennae are distinctly clavate; the first segment widely exceeds the head, and has the anterior edge even, but with a regular row of flattish granules just behind the margin all around; it is as wide as the second segment. Segments dorsally ornamented with three regular, transverse rows of small though distinct subconic granules, each provided with a hair; the lateral and posterior margins are sinuate-dentate. Pores of the usual distribution, distinct, submarginal, located near the middle of the lateral edge on anterior segments, more remote and farther back on posterior."

In a subsequent paper (1911) Cook published some additional notes on *Cryptodesmus*, and three figures drawn from the type of *olfersi*. Cook nowhere referred directly to the form of the gonopods in this genus, but on page 460 of his 1911 essay, there is an indirect statement that the coxae are not globosely enlarged to accommodate the telopodites as is the case of various other groups. But in emphasizing the close relationship of *C. olfersi* to another Brasilian species, *Apomus pusillus* (Attems), Cook provided a basis for comparison with forms in which the gonopods are now well-known. In recent years a number of additional genera and species have been described by Dr. Otto Schubart, these seem all to be confamilial with *Cryptodesmus* in the strict sense.

In my opinion, the family Cryptodesmidae can be recognized by the characters cited by Cook for *Cryptodesmus*, with the addition of the peculiar gonopods. The location of the ozopores in a normal, marginal peritrematic swelling appears to be a ready key character. I must agree entirely with the opinion of Cook that *Peridontodesmus* is quite closely related to *Cryptodesmus*, and doubt that the family name *Peridontodesmidae* can be defended.

The status of the other families mentioned above is much less easy to evaluate, particularly the four names Stylodesmidae-Hercodesmidae-Chytodesmidae-Stiodesmidae. The first was based upon the occurrence of ozopores upon long erect processes, the second was separated from the otherwise similar Stiodesmidae because of the concealment of the epiproct. Both of these two characters are now known to be very mutable, in fact the pores may be on stalks, or flush with the surface, or even absent, in species which are otherwise almost identical. In recent years I have published redescriptions of *Stylodesmus* and *Hercodesmus,* both African genera, but so far the characters of both *Chytodesmus* and *Stiodesmus* remain largely unknown, at least as regards the type species. Until this deficiency can be corrected, there seems to be little hope of putting the confusion to rights. I venture the opinion, however, that Cook's original groupings will be largely vindicated, and set forth below a list of the genera known to me which appear to form a natural group that can be designated by the name *Chytodesmidae*. In this case the group must be, for the time being, defined by the characters of its component genera, but

this should provide no difficulty to workers familiar with Neotropical polydesmoids. The generic names are listed chronologically by date of publication, and each is followed by the name of the type species and its place of origin. The list obviously is incomplete, and perhaps one or two of the names might better be transferred out to a different family.

CHYTODESMIDAE Cook, 1896

Chytodesmus Cook, 1896 [**laqueatus** Karsch, Cuba].
Tridesmus Cook, 1896 [**sectilis** Cook, Porto Rico].
Docodesmus Cook, 1896 [**vincenti** Pocock, St. Vincent].
Stictodesmus Cook, 1896 [**creper** Cook, Colombia].
Iomus Cook, 1911 [**incisus** Cook, Porto Rico].
?**Choridesmus** Cook, 1896 [**citus** Cook, Liberia, perhaps not chytodesmid].
Corypherepsis Attems, 1914 [**lacertosus** Brolemann, Venezuela].
Iomoides Loomis, 1934 [**hispidus** Loomis, Hispaniola].
Lobodesmus Loomis, 1936 [**granosus** Loomis, Hispaniola].
Cyphotylus Loomis, 1936 [**prolatus** Loomis, Hispaniola].
Coccoelasma Loomis, 1936 [**incisura** Loomis, Hispaniola].
Henicomus Loomis, 1941 [**septiporus** Loomis, Hispaniola].
Jeekelia Loomis, 1950 [**granulosa** Loomis, Hispaniola].
Liomus Chamberlin, 1950 [**albanus** Chamberlin, Porto Rico].
Tarmadesmus Kraus, 1959 [**azacurensis** Kraus, Peru].
Docodesmiella Loomis, 1961 [**insularis** Loomis, Panama].

Important substantiation to the validity of the foregoing group of genera is suggested by the geographic distribution: the northern Andean region and the West Indies. Species of the Chytodesmidae occur over almost the same areas as millipeds of the families Epinannolenidae, Stemmiulidae, Platyrachidae as well as various genera in other families, such as *Microspirobolus*. The relationship between various genera and particular geographic regions is so constant and pervasive, especially in diplopods, as to compel of itself a search for structural affinities even when these may be unsuspected. In the present case, species of the genera listed have ample similarity, even without the confirmation of occurring in a natural and cohesive distributional pattern.

REFERENCES

Cook, O. F. 1896. *Cryptodesmus* and its allies. Brandtia, no. 5, pp. 19-28 [contains the original diagnoses of Hercodesmidae, Chytodesmidae, and Stiodesmidae, and a redefinition of Cryptodesmidae, all are very brief and phrased in general terms only].

————. 1911. New tropical millipeds of the order Merocheta, with an example of kinetic evolution. Proc. U. S. Nat. Mus., vol. 40, pp. 451-473 [a number of disconnected short essays on the status of various Neotropical chytodesmid and cryptodesmid forms, interspersed with the diagnoses of a number of new species, two new genera, and a new family].

Loomis, H. F. 1936. The millipeds of Hispaniola, with descriptions of a new family, new genera, and new species. Bull. Mus. Comp. Zool., vol. 80, no. 1,

pp. 1-191 [key to Hispaniolan polydesmoid families, page 78, separates the Eoromidae, Hercodesmidae, Stiodesmidae, and Chytodesmidae].

————. 1941. Millipeds collected in Puerto Rico and the Dominican Republic by Dr. P. J. Darlington in 1938. Bull. Mus. Comp. Zool., vol. 88, no. 2, pp. 17-80 [key, page 67, to the West Indian genera of Chytodesmidae, includes nine genera. Loomis is the only recent worker to consistently recognize Cook's family names].

NOTES ON AMERICAN MOSQUITO PUPAE. III. DESCRIPTION OF NEARCTIC SUBGENUS MANSONIA AND KEY TO ALL NEARCTIC SPECIES OF THE GENUS MANSONIA[1]

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Mosquitoes of the genus *Mansonia* Blanchard are among the most fierce biters of all the mosquito pests (Pratt, 1953). Medically, *Mansonia perturbans* (Walker) has been incriminated as a vector of eastern encephalitis by Howitt *et al.* (1949), while Gilyard (1945) stated that *Mansonia titillans* (Walker) could be a possible vector of Venezuelan equine encephalitis. Therefore it is important to be able to recognize all stages of these important species, including the pupae, here described.

The objectives of this study are two-fold: (1) to completely describe the chaetotaxy and other taxonomic characters, *e.g.*, trumpet and paddle, of the pupae of the subgenus *Mansonia* Blanchard of the Nearctic region and (2) to formulate an identification key to all the Nearctic species of the genus *Mansonia*.

REVIEW OF LITERATURE

A partial description of the pupae of *Mansonia indubitans* (Dyar and Shannon) was published by Pratt (1945). In 1953 Pratt described three groups of *Mansonia* mosquitoes: the *indubitans* group, the *flaveolus* group and the *titillans* group. He included some information about the chaetotaxy of the pupae, but used only trumpet and paddle characters for the separation of major groups. Perez Vigueras (1948) presented a lateral drawing of the pupa of *M. titillans*, but no description of the chaetotaxy of the pupa was included. Darsie (1951) has published a complete description of *M. perturbans* and the reader is referred to this for limited information concerning the subgenus *Coquillettidia* Dyar. Lane (1953) characterized the pupae of the genus *Mansonia*, but included no description of the chaetotaxy.

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